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A water-vapour-permeable waterproof shoe.

A water-vapour-permeable, waterproof shoe has a shoe upper 1 to enclose the wearer's foot formed from a water-vapour-permeable, waterproof fabric, a shoe sole 3 having air permeable openings 5 therein, and a mesh or other porous layer 2 of protective material positioned between the shoe upper 1 and the shoe sole 3, the upper, mesh and sole being bonded together at least in the edge area around the mesh. The openings 5 in the sole allow the sole of the wearer to "breathe", thereby providing a more comfortable shoe.



A WATER-VAPOUR-PERMEABLE, WATERPROOF SHOE

The present invention concerns a water-vapour permeable, waterproof shoe.

It is well known that many conventional shoes give the feet of the wearer a damp, sweaty feeling. Accordingly, there have been various proposals in the past concerning the use of a water-vapour-permeable waterproof fabric as a shoe upper in order to eliminate the damp, sweaty feeling encountered in conventional shoes.

However, even if water vapour permeability was obtained in the shoe upper, an impermeable structure, generally consisting of a synthetic resin or rubber, was used for the sole of the shoe, where 60% or more of the perspiration of the foot reportedly occurs when such shoes are worn. As a result, the water vapour permeation effect in the shoe upper, and the accompanying comfort of the shoe, are adversely affected. Specifically, even if the shoe is referred to as a "waterproof, water-vapour-permeable shoe", the possible total water vapour permeation effect can be reduced by 60% or more in the important area of the sole of the foot.

According to the present invention there is provided a water-vapour-permeable, waterproof shoe comprising a shoe upper to enclose the wearer's foot formed from a water-vapour-permeable, waterproof fabric, and a shoe sole having air permeable openings therein, and a layer of porous protective material, generally in the shape of said shoe sole, positioned between said shoe upper and said shoe sole, said shoe upper, protective layer and shoe sole being bonded together at least around the outside of said protective layer.

The shoe upper is preferably formed of porous, expanded polytetrafluoroethylene. The protective layer may be a porous plastics or a mesh of plastics or metal such as stainless steel.

The invention will now be particularly described with reference to the single figure of the drawing which is an exploded, partially cut-away perspective view of the parts of a shoe according to the invention.

A water-vapour-permeable, waterproof shoe is provided having a shoe upper to enclose the wearer's foot formed from a water-vapour-permeable, waterproof fabric, a shoe sole having air permeable openings therein, and a mesh or other porous layer of protective material positioned between the shoe upper and the shoe sole, the upper, mesh and sole being bonded together at least in the edge area around the mesh. The openings in the sole allow the sole of the wearer to "breathe", thereby providing a more comfortable shoe.

When shoes according to the present invention are worn, a state of close contact is formed be-

tween the foot and the shoe and friction occurs between the foot and the sole of the shoe. However, air and water vapour can permeate through the air permeation holes in the sole of the shoe, where concentration of perspiration resulting from the above-mentioned contact is great. Movement during walking results in a repetitive cycle of increased pressure and decreased pressure inside the shoe, so that the aforementioned air permeation through the sole of the shoe is increased. Indentations and projections are formed on the outer surface of the shoe sole in order to prevent slipping, and the aforementioned air and water vapour permeation are made more effective by causing the air permeation holes to open into the indentations on the outer surface of the shoe sole.

The mesh or layer of other protective porous material prevents the waterproof, water-vapour-permeable fabric and the sole of the foot of the wearer from being injured by foreign matter entering the shoe via the air permeation holes in the sole of the shoe. Accordingly, the air permeation holes may be made relatively large.

In any case, since the air and water vapour permeation are accomplished through the sole of the shoe, the interior of the shoe does not become damp or sweaty. Accordingly, comfortable wearing of the shoe and walking in the shoe are possible.

In the illustrated embodiment, a shoe upper 1 (including a bottom surface) is formed from a waterproof, water-vapour-permeable fabric such as a porous, expanded polytetrafluoroethylene film. A layer of a protective porous material 2 with a fine structure is bonded to the bottom surface of the aforementioned shoe upper 1, and a shoe sole 3 is attached to the layer of protective porous material 2. A metal mesh of a non-corroding or corrosion-resistant metal such as stainless steel, or a mesh sheet made of a synthetic resin such as polypropylene or polyethylene, or a continuously porous synthetic resin foam, or a woven fabric of natural or synthetic fibers may be used for the protective porous material. Indentations and projections 4 which extend to the side edges of the shoe are formed on the bottom surface of the shoe sole 3 in order to prevent slipping. Air permeation holes 5 which connect with the upper surface of the shoe sole 3 are formed in indentations in the bottom surface of the shoe sole 3.

The shoe upper 1, the layer of protective porous material 2 and the shoe sole 3 are connected by a connecting means such as an adhesive or sewing. In the case of bonding by means of an adhesive, the bonding is performed in the periphery of the shoe sole so that air and water vapour

permeation through the permeation holes 5 is not hindered.

Claims

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1. A water-vapour-permeable, waterproof shoe comprising a shoe upper to enclose the wearer's foot formed from a water-vapour-permeable, waterproof fabric, and a shoe sole having air permeable openings therein, and a layer of porous protective material, generally in the shape of said shoe sole, positioned between said shoe upper and said shoe sole, said shoe upper, protective layer and shoe sole being bonded together at least around the outside of said protective layer.

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2. A shoe according to claim 1 wherein said shoe upper is formed of porous, expanded polytetrafluoroethylene.

3. A shoe according to claim 1 or claim 2 wherein said protective layer is made of a porous plastics.

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4. A shoe according to claim 1 or claim 2 wherein said protective layer is a mesh.

5. A shoe according to claim 4 wherein said mesh is made of plastics.

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6. A shoe according to claim 4 wherein said mesh is made of metal.

7. A shoe according to claim 6 wherein said mesh is made of stainless steel.

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